This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (Previously presented) A system for handling substrates held in a carrier, the system comprising:

a robot including an articulated robotic arm;

a processor for controlling the robotic arm;

an end effector attached to a moveable end of the robotic arm, the end effector comprising a blade having a first end and a second end defining a critical plane, the blade having an active area configured to measure a distance between the substrate and the critical plane; and

a mapping sensor disposed on the articulated robotic arm, the mapping sensor configured to measure to the position and orientation of the substrate within the carrier; and

a passive gripped attached to the first end of the blade and an active gripper attached to the second end of the blade.

2. (Previously presented) The system of claim 1 wherein the mapping sensor is configured to detect the mean vertical location of a substrate disposed within the carrier.

3. (Original) The system of claim 1 wherein the blade comprises a silicon wafer.

4. (Original) The system of claim 1 wherein the blade comprises a ceramic.

5. (Original) The system of claim 1 wherein the blade has a thickness less than 1000 microns.

6. (Original) The system of claim 1 wherein the blade has a thickness less than 750 microns.

7. (Original) The system of claim 1 wherein the active area is formed on the blade from a metalization process.

8. (Previously presented) The system of claim 1 wherein the active area is configured to measure at least one of the mean vertical location, the thickness variation, the bow and warp, tilt, and deviation of the substrate within the substrate carrier.

9. (Original) The system of claim 1 wherein the active area comprises a measurement transducer.

10. (Original) The system of claim 1 wherein the active area comprises a capacitance probe.

11. (Original) The system of claim 1 wherein the active area comprises at least one of optical sensor, pneumatic sensor, inductive sensor, and ultrasonic sensor.

12. (Original) The system of claim 1 wherein the active area comprises at least three discrete sensors for providing planar information of the substrate.

13. (Original) The system of claim 1 wherein the active gripper is pneumatically actuated.

14. (Original) The system of claim 1 wherein the active gripper comprises a servo gripper coupled to a linear motor.

15. (Original) The system of claim 13 wherein the active gripper provides feedback to the processor for determining positive engagement with the substrate.

16. (Original) The system of claim 13 wherein the active gripper provides feedback to the processor for determining the center of the substrate.

17. (Previously presented) The system of claim 1 further comprising a substrate prealigner and a prealigner chuck, wherein the prealigner chuck is sized and configured to reduce rotational inertia.

18. (Previously presented) The system of claim 17 wherein the prealigner chuck comprises a plurality of embattlements for engaging an exclusion zone extending about 3 mm from the outside circumferential periphery of a substrate.

19. (Cancelled)

20. (Previously presented) The system of claim 17 wherein the prealigner chuck comprises a plurality of holes to optimize the inertial properties and torque requirement of the prealigner chuck.

21. (Currently amended) A method for handling substrates held in a carrier, the method comprising:

moving an end effector defining a critical plane across an edge of the substrates;

measuring coordinate information of the substrates in the carrier with a mapping sensor;

storing the coordinate information;

sequentially indexing the robotic arm to the substrates in the carrier according to the stored coordinate information;

measuring a distance between the substrate and the critical plane with a substrate sensor disposed on the end effector; and

engaging the substrate with <u>the</u> robotic arm.

22. (Original) The method of claim 21 wherein the coordinate information includes at least one of mean vertical location, the thickness variation, the bow and warp, tilt and deviation of the substrate within the substrate carrier.

23. (Previously presented) A method for handling substrates held in a cassette, the method comprising:

providing a robotic arm including a mapping sensor and an end effector including a substrate sensor, the end effector defining a critical plane;

moving the mapping sensor proximate to the cassette and recording the mean vertical substrate locations;

generating a pick table including mean vertical substrate location data;

sequentially indexing the robotic arm according to the mean vertical substrate locations of the pick table;

engaging the cassette with the end effector;

measuring a distance between the substrate and the critical plane with a substrate sensor disposed on the end effector;

verifying the substrate position with the substrate sensor; and

capturing and removing the substrate from the cassette with the robotic arm.

24. (Original) The method of claim 23 wherein the generating of the mean vertical substrate location data is accurate to within 135 microns.

25. (Original) The method of claim 23 wherein the recording of the mean vertical substrate location is accurate to within 100 microns.

26. (Original) The method of claim 23 further comprising prealigning the substrate after removing the substrate from the cassette.

27. (Original) The method of claim 23 wherein the robotic arm includes an end effector comprising a blade having a first end and a second end, the blade having an active area for sensing a distance between the end effector and the substrate.

28. (Original) The method of claim 23 wherein end effector includes a passive gripper attached to the first end of the blade and an active gripper attached to the second end of the blade.

29. (Previously presented) A robotic end effector for holding a substrate, the end effector comprising:

a mapping sensor configured to measure the position and orientation of the substrate;

a blade having a first end and a second end defining a critical plane;

an active area for sensing a distance between the substrate located along the blade and the critical plane; and

a passive gripper attached to the first end of the blade and an active gripper attached to the second end of the blade.

30. (Original) The robotic end effector of claim 29 wherein the active area is formed from a metalization process.

31. (Original) The robotic end effector of claim 29 wherein the end effector includes a sensor for detecting the mean vertical location of a substrate.

32. (Original) The robotic end effector of claim 29 wherein the active area comprises at least three discrete sensors for providing planar information of the substrate.

33. (Original) The robotic end effector of claim 29 wherein the active area is adapted to provide at least one of the mean vertical location, the thickness variation, the bow and warp, tilt, and deviation of the substrate within the substrate carrier.

34. (Original) The robotic end effector of claim 29 wherein the active area comprises a measurement transducer.

35. (Original) The robotic end effector of claim 29 wherein the active area comprises a capacitance probe.

36. (Original) The robotic end effector of claim 29 wherein the active area comprises at least one of optical sensor, pneumatic sensor, inductive sensor, and ultrasonic sensor.

37. (Currently amended) The robotic end effector of claim 29 further [comprises] <u>comprising</u> a mapping sensor for detecting the mean vertical location of a substrate.

38. (Original) The robotic end effector of claim 35 wherein the mapping sensor comprises a laser transducer.

39. (Original) The robotic end effector of claim 29 wherein the blade comprises a silicon wafer.

40. (Original) The robotic end effector of claim 29 wherein the blade comprises a ceramic substrate.

41. (Original) The robotic end effector of claim 29 wherein the blade has a thickness less than 1000 microns.

42. (Original) The robotic end effector of claim 29 wherein the blade has a thickness less than 750 microns.